

1 Image Processing System and
 Information Processing Apparatus

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BACKGROUND OF THE INVENTION

5 Field of the Invention

The present invention relates to an image processing system for photographing an image and an information processing system.

Related Background Art

10 In the past, electronic still cameras capable
of recording still images on a recording medium such
as a memory card having solid-state memory elements
have been put on the market. Electronic pocketbooks
and portable computers, for which memory cards can be
15 used, have also been commercialized. For inputting
an image to a portable computer or the like, an image
photographed using an electronic still camera is
recorded in a memory card and then the card is
inserted into the portable computer so that the image
20 is read out.

However, in the foregoing method of recording an image photographed by an electronic still camera on a memory card and inserting the card into a portable computer for image reading, many steps must
25 be taken for photography. Moreover, both the electronic still camera and portable computer must be carried about. This is very inconvenient.

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1 According to the present invention, an information processing apparatus and an image pickup apparatus have easy-to-use configurations.

5 SUMMARY OF THE INVENTION

 An object of the present invention is to provide an image processing system and information processing system for solving all or part of the aforesaid problems.

10 Another object of the present invention is to provide a user-friendly image processing system, information processing apparatus, and image pickup apparatus.

 In an effort to accomplish the foregoing
15 objects, an image processing system is disclosed as a preferred embodiment of the present invention. The image processing system comprises an information processing apparatus including operating means for entering information, processing means for processing
20 and outputting information entered at the operating means, and an interface for connecting an external apparatus, and an image pickup apparatus detachable from the interface, including image pickup means for picking up an object image, and storage means for
25 storing programs one of which is run by the processing means to operate the image pickup means.

 Another object of the present invention is to

1 provide an image processing system, information
processing apparatus, and image pickup apparatus that
permit expanded periods of use.

Yet another object of the present invention is
5 to provide an information processing apparatus and a
system including the information processing apparatus
that are preferable for implementing novel image
pickup facilities therein.

Other objects and features of the present
10 invention will be apparent from the embodiments and
drawings below.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is comprised of Figs. 1A and 1B showing
15 block diagrams of a configuration of an embodiment
of the present invention;

Fig. 2 is comprised of Figs. 2A and 2B showing
flowcharts of a main routine in this embodiment;

Fig. 3 is comprised of Figs. 3A and 3B showing
20 flowcharts of an image pickup program running routine
in this embodiment;

Fig. 4 is a flowchart of a distance measure-
ment and photometry routine in this embodiment;

Fig. 5 is a flowchart of a photography routine
25 in this embodiment;

Fig. 6 is comprised of Figs. 6A and 6B showing
block diagrams of a configuration of the second

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1 embodiment of the present invention;

Fig. 7 is comprised of Figs. 7A and 7B showing flowcharts of an imaging program running routine in the second embodiment;

Fig. 8 is comprised of Figs. 8A and 8B showing block diagrams of a configuration of the third or fourth embodiment of the present invention;

Fig. 9 is comprised of Figs. 9A and 9B showing
flowcharts of an imaging program running routine in
the third embodiment;

Fig. 10 is comprised of Figs. 10A and 10B showing flowcharts of an imaging program running routine in the fourth embodiment;

Fig. 11 shows an example of an image pickup
15 apparatus 200 according to the present invention;

Fig. 12 shows an example of an image pickup apparatus 500 according to the present invention;

Fig. 13 shows an embodiment of an imaging system of the present invention;

20 Fig. 14 shows an embodiment of an imaging
system of the present invention;

Fig. 15 is comprised of Figs. 15A and 15B showing block diagrams of a configuration of the sixth embodiment of the present invention;

25 Fig. 16 is comprised of Figs. 16A and 16B
showing flowcharts of a main routine in the embodiment
shown in Figs. 15A and 15B;

Fig. 27 is a flowchart of a main routine in
25 still another embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

1 An embodiment of the present invention will be
described with reference to the drawings.

 In Figs. 1A and 1B, reference numeral 200
denotes an image pickup apparatus and 300 denotes an
5 information processing apparatus.

 The image pickup apparatus 200 comprises image
pickup means 202, program storage means 50, an inter-
face 52, and a connector 54.

 Reference numeral 50 denotes program storage
10 means for storing programs each describing imaging
for the image pickup means 202. The stored programs
are run by the information processing apparatus 300.
52 denotes an interface for providing the interface
with the information processing apparatus 300. 54
15 denotes a connector for use in transferring a data
signal or a control signal to or from the information
processing apparatus 300 and supplying power to the
program storage means 50.

 The configuration of the image pickup means
20 202 will be described below.

 Reference numeral 10 denotes a lens array.
12 denotes a shutter having a capability of a
diaphragm. 14 denotes an image pickup element for
converting an optical image into an electric signal.
25 16 denotes an A/D converter for converting analog
output of the image pickup element 14 into a digital
signal. 18 denotes a clock circuit for supplying a

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10 Reference numeral 20 denotes a memory control
circuit for controlling the clock circuit 18, image
compression/extension circuit 22, and image memory
24. Data provided by the A/D converter 16 is written
in the image memory 24 via the memory control circuit
15 20.

Reference numeral 30 denotes a shutter drive circuit for driving the shutter 12. 32 denotes a lens drive circuit for driving a focusing lens in the lens array 10. 34 denotes a distance measuring circuit for measuring a distance to an object. 36 denotes a

1 apparatus 300 will be described below.

Reference numeral 60 denotes control means for
controlling the whole information processing apparatus
300. 62 denotes memory means for storing programs and
5 variables for performing the operations, which will be
described later, of the control means 60. 64 denotes
a display means for displaying characters, images,
and voice required with the run of a program in the
control means 62; such as, a liquid crystal display
10 unit or a loudspeaker. 66 denotes operating means for
use in entering a variety of operational commands to
be sent to the control means 60.

Reference numeral 68 denotes a power circuit.
70 denotes a battery. The power circuit 68 comprises
15 a battery detector, a DC-DC converter, and a switch
for selecting a block to be energized. The power
circuit 68 detects the presence or absence of the
battery 70, the type of the battery 70, and an amount
of power remaining in the battery 70, controls the
20 DC-DC converter according to the result of detection
and the instruction sent from the control means 60,
and then supplies required voltages for a required
time interval.

Reference numeral 72 denotes an interface for
25 providing the interface with the image pickup apparatus
200. 74 denotes a connector for use in transferring
a data signal and a control signal to or from the

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1 image pickup apparatus 200 and supplying power to an
interface 52 and the program storage means 50.

Reference numeral 76 denotes a recording medium
90 such as a hard disk or a memory card, or an inter-
5 face for providing the interface with communication
means 100. 78 denotes a connector for use in trans-
ferring a data signal and a control signal to or from
the recording medium 90 and supplying power to the
recording medium 90. 80 denotes a connector for use
10 in transferring a data signal and a control signal to
or from the communication means 100 and supplying
power to the communication means 100.

Reference numeral 82 denotes an image pickup apparatus detachment detecting means for detecting the detachment of the image pickup apparatus 200 from the information processing apparatus 300 using a mechanical, electrical, or optical method.

Reference numeral 90 denotes a recording medium such as a hard disk or a memory card. 92 denotes a connector for use in transferring a data signal or a control signal to or from the information processing apparatus 300 and receiving power. 94 denotes an interface for providing the interface with the information processing apparatus 300. 96 denotes a recording area for use in recording an image signal.

Reference numeral 100 denotes a communication

1 means for communicating with external equipment over a
communication line. 102 denotes a connector for use in
transferring a data signal and a control signal to or
from the information processing apparatus 300 and
5 receiving power. 104 denotes an interface for
providing the interface with the information pro-
cessing apparatus 300. 106 denotes a communication
control circuit for controlling the communication with
external equipment. The communication control circuit
10 controls communication according to the protocol of a
layer to be connected by running a predetermined
program, and converts, inversely converts, modulates,
and demodulates data. 108 denotes a connector for use
in transferring a data signal and a control signal to
15 or from external equipment over a communication line.
The use of the connector 108 permits transmission or
other communication to or from external equipment
directly or over a communication line.

The connectors 78, 80, 92, 102, and 108 can
20 convey not only electric signals but also other various
signals such as mechanical, optical, and acoustic
signals. Needless to say, there is no problem in a
configuration having pluralities of interfaces 76,
connectors 78, connectors 80, recording media 90, and
25 communication means 100, or in a configuration in
which both or either of the recording medium 90 and
communication means 100 is united with the information

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1 processing apparatus 300.

Referring to Figs. 2A, 2B, 3A, 3B, 4, and 5,
the operation of the first embodiment will be
described. Figs. 2A and 2B are a flowchart of a main
5 routine in this embodiment.

When the power supply of the information processing apparatus 300 is turned on or when a new battery is loaded therein, the control means 60 resets flags and control variables, and runs a control program stored in an area of the memory means 62; such as, in operating system (S1). By running the control program, the control means 60 receives a signal from a main switch in the operating means 66.

When the main switch in the operating means 66
15 is off (S2), the control means 60 determines whether
the power circuit 68 is in a power-off state in which
power is supplied only to the smallest possible block
to be energized or in a power-on state in which power
is also supplied to the display means 64 (S15). If
20 the power circuit 68 is in the power-on state, the
control means 60 quits the display screen on the
display means 64 and places the power circuit 68 in
the power-off state (S16). The control means 60 then
waits until the main switch in the operating means 66
25 is pressed (S2).

If the main switch in the operating means 66 is on (S2), the control means 60 determines whether the

1 power circuit 68 is in the power-off state or power-
on state (S3). If the power circuit 68 is not in the
power-on state, the control means 60 places the power
circuit 68 in the power-on state, and produces a
5 predetermined necessary display screen on the display
means 64 using characters, numerals, and pictures
such as an icon so as to receive information entered
at the operating means 66.

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10 The control means 60 uses the image pickup
apparatus detachment detecting means 82 to determine
whether the image pickup apparatus 200 is connected
to the information processing apparatus 300 (S5).
Depending on whether the image pickup apparatus 200 is
connected or not, the control means 60 sets (S6) or
15 resets (S7) an image pickup apparatus connection flag.
The image pickup apparatus connection flag is stored
in an internal register of the control means 60 or
part of the memory means 62.

20 If an imaging switch in the operating means 66
is off (S8), the control means 60 quits the predeter-
mined display screen necessary for imaging on the
display means 64; that is, the display screen showing
an icon for generating a trigger pulse used to start
imaging or the display screen showing information
25 independent of the image pickup apparatus, for example,
a trigger switch alone (S17). The control means 60
then waits until a command is entered at the operating

1 means 66.

After the step S17, if a command, for example, a command for use in causing the information processing apparatus to execute calculation is entered (S18), the control means 60 executes predetermined processing associated with the command for the information processing apparatus (S19). When the predetermined processing terminates, control is returned to A in the flowchart. The control means 60 produces a predetermined necessary display screen on the display means 64 using characters, numerals, and pictures such as an icon so as to receive information entered at the operating means 66. The control means 60 then waits until the main switch in the operating means 66 is pressed (S2).

When the imaging switch in the operating means 66 is on (S8), the control means 60 produces a predetermined display screen necessary for imaging (S9) on the display means 64.

The predetermined display screen necessary for imaging is, for example, a screen on the display means 64 in which an operation mode of the image pickup apparatus 200 such as a single photography mode, a continuous photography mode, or a self-timer photography mode, information concerning distance measurement or photometry, an operating state of the flash 38, an amount of power remaining in the battery 44, a

1 the same manner as a camera without unnaturalness.

When the image pickup apparatus connection flag is reset (S10), the control means 60 produces a monitor-mode display screen on the display means 64
5 (S14). The control means 60 then returns control to the step A in the flowchart and waits until the main switch in the operating means 66 is pressed (S2).

When the image pickup apparatus connection flag is set (S10), the control means 60 produces a
10 through-mode display screen on the display means 64 (S11). A program describing how to operate the image pickup apparatus 200 is then read from the program storage means 50, and stored in an area of the memory means 62 via the interface 52, connector 54, connector
15 74, and interface 72 (S12).

The control means 60 reads a program describing how to operate the image pickup apparatus 200 from the memory means 62, and runs it (S13). With the run of the program, the control means 60 produces a predetermined display screen necessary for imaging on the
20 display means, actuates the components in the image pickup apparatus 200 sequentially in response to commands entered at the operating means 66, and thus achieves imaging.

25 When all the imaging operations are completed, the control means 60 terminates the execution of an imaging mode, produces the predetermined necessary

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1 display screen on the display means using characters,
numerals, and pictures such as an icon so as to receive
information entered at the operating means 66, and
then waits until the main switch in the operating
5 means 66 is pressed (S2).

Figs. 3A and 3B are a detailed flowchart of the imaging program to be run at the step S13 in Fig. 2B. The description will proceed on the assumption that a data signal and a control signal are transferred between the control means 60 and image pickup control circuit 40 via the interface 72, connector 74, connector 54, and interface 52.

1 other general items have already been displayed. At
the step S9 in Fig. 2B, therefore, information
inherent to the mounted image pickup apparatus 200,
for example, as mentioned above, the items and
5 numerical values dependent on the specifications and
performance of the image pickup apparatus 200 are
indicated with characters, numerals, and pictures such
as an icon.

The control means 60 instructs the image pickup control circuit 40 to initialize the image pickup means 202. In response to the instruction, the image pickup control circuit 40 resets flags and variables, turns on the power circuit 42, and initializes the components in the image pickup means 202 (S23). By the initialization, the components are set to mean values, limit values, or any other values of controllable ranges.

The control means 60 instructs the image pickup control circuit 40 to produce a through-mode display screen. In response to the instruction, the image pickup control circuit 40 transfers an image formed on the image pickup element 12 to the information processing apparatus 300 via the A/D converter 16, memory control circuit 20, image memory 24, memory control circuit 20 again, interface 52, and connector 54. The control means 60 writes acquired image data in an internal video memory of the display means 64

The control means 60 determines whether image data acquired by the image pickup apparatus 200 can be recorded on the memory means 62 or recording medium 90 (S26). If recording cannot be done because a recordable empty area is unavailable or no recording medium is connected, the control means 60 displays a warning on the display means 64 (S35), quits the imaging display screen and viewfinder display screen on the display means 64 (S36), and terminates the run of the imaging program (S13). When terminating the run of the image pickup program, the control means 60 instructs the image pickup control circuit 40 to terminate the operation of the image pickup means 202. The image pickup control circuit 40 executes the termination processing required for the components of the image pickup means 202, and then turns off the power circuit 42.

1 When an area in which image information can
be recorded is available (S26), if the distance
measuring/photometry switch (SW1) is turned on using
the operating means 66 (S27), the control means 60
5 instructs the image pickup control circuit 40 to
execute distance measurement and photometry. The
image pickup control circuit 40 allows the distance
measuring circuit 34 and photometry circuit 36 to
execute distance measurement and photometry, focuses
10 the lens array 10 at an object, and determines a
shutter speed (S28). The distance measurement and
photometry will be described in detail later.

 The control means 60 repeats distance measure-
ment and photometry (S28) until the distance
15 measurement/photometry switch (SW1) and image pickup
switch (SW2) are turned on using the operating means
66 (S29).

 When the imaging switch (SW2) is turned on
using the operating means 66 (S29), the control means
20 60 determines whether image data acquired by the
image pickup apparatus 200 can be recorded in the
memory means 62 or the recording medium 90 (S30).
If recording cannot be done because a recordable
empty area is unavailable or the recording medium is
25 disconnected, the control means 60 displays a warning
on the display means 64 (S34), and then waits until
the imaging switch in the operating means 66 is

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1 pressed (S25).

If a recordable area is available (S30), the control means 60 instructs the image pickup control circuit 40 to execute photography. The image pickup control circuit 40 executes photography and writes image data in the image memory 24 (S31). This photography will be described in detail later.

If the next photography is performed soon (S32), control is returned to the step S29. The aforesaid sequence is repeated.

When continuous photography is not executed or the next photography is not performed because the image memory 24 is full (S32), the control means 60 instructs the image pickup control circuit 40 to execute recording. The image pickup control circuit 40 reads image data from the image memory 24, and sends the image data to the information processing apparatus 300 via the memory control circuit 20, interface 52, and connector 54. The control means 60 writes the received image data in the memory means 62 via the connector 74 and interface 72. The control means 60 may also write the receive image data in the recording medium 90 via the interface 76 and connector 78 (S33). The control means 60 then returns control to the step S29.

If the distance measurement/photometry switch (SW1) in the operating means 66 is turned off (S27),

1 the control means 60 waits until the imaging switch
in the operating means 66 is pressed (S25).

Fig. 4 is a detailed flowchart of the distance
measurement and photometry to be executed at the step
5 S28 in Fig. 3B. The image pickup control circuit 40
allows the distance measuring circuit 34 to measure a
distance to an object, and then stores the measured
data in the internal memory thereof (S41). The image
pickup control circuit 40 allows the photometry means
10 36 to measure a brightness level of the object, and
then stores the metered data in the internal memory
thereof (S42). The metered value provided by the
photometry circuit 36 is checked to see if the flash
is needed (S43). If the flash is needed, a flash
15 flag is set. The flash 38 is then charged (S44).

Fig. 5 is a detailed flowchart of the photo-
graphy to be executed at the step S31 in Fig. 3B.

The image pickup control circuit 40 reads the
data of a distance to an object from the internal
20 memory thereof, and allows the lens drive circuit 32
to drive the focusing lens in the lens array 10. The
lens array 10 is thus focused at the object (S51).
Based on the photometry data stored in the internal
memory of the image pickup control circuit 40, the
25 shutter drive circuit 30 causes the shutter 12 to
open (S52). The image pickup element 14 is then
exposed to light (S53). The flash flag is checked to

1 see if the flash 38 is needed (S54). If the flash 38
is needed, the flash 38 is actuated to generate flash-
light (S55). The image pickup control circuit 40
waits until exposure of the image pickup element 14
5 to light is completed (S56). The image pickup
control circuit 40 then closes the shutter 12 (S57),
reads a charged signal from the image pickup element
14, and writes the data of an photographed image in
the image memory 24 using the A/D converter 16 and
10 memory control circuit 20 (S58).

(Another embodiment)

The second embodiment of the present invention will be described below.

Figs. 6A and 6B are a block diagram of the
15 second embodiment of the present invention.

In Fig. 6A, reference numeral 400' denotes an image pickup apparatus. Differences of Figs. 6A and 6B from Figs. 1A and 1B will be described.

The image pickup apparatus 400' comprises an
20 image pickup means 402, a recording medium 426, a
program storage means 405, an interface 452, and a
connector 454.

Reference numeral 450 denotes program storage means for storing programs each describing imaging for the image pickup means 402. The stored programs are run by the information processing apparatus 300.

The recording medium 426 may be a semiconductor

1 memory, a magnetic tape, a magnetic disk, a magneto-
optical disk, or the like. The recording medium 426
may be fixed to or demountable from the image pickup
apparatus 400. The recording medium 426 may comprise
5 a plurality of recording media or a plurality of
types of recording media. Some of the recording media
may be fixed to the image pickup apparatus 400, while
the remaining recording media may be demountable
therefrom.

10 The image pickup means 402 has components 410
to 424, and 430 to 446. These components are
equivalent to the components 10 to 24, and 30 to 46
in the first embodiment, of which description will
therefore be omitted from the description of the
15 second embodiment.

Referring to Figs. 2A, 2B, 4, 5, 7A and 7B,
the operation of the second embodiment will be
described. The main routine in the second embodiment
is identical to that in the first embodiment described
20 in conjunction with the flowchart of Figs. 2A and 2B,
of which description will therefore be omitted.

Figs. 7A and 7B are a detailed flowchart of
the imaging program to be run at the step S13 in Fig.
2B. The description below will proceed on the
25 assumption that a data signal and a control signal
are transferred between the control means 60 and image
pickup control circuit 440 via the interface 72,

1 connector 74, connector 454, and interface 452.

The control means 60 reads data (image pickup information) inherent to the mounted image pickup apparatus 400 from a program stored in an area of the memory means 62 at the step S12 in Fig. 2B and written to operate the image pickup apparatus 400 (S61), and produces a display screen necessary for imaging on the display means 64 according to the read imaging information (S62).

10 The contents of the "display screen necessary
for imaging" such as a position, a color, a frame,
and other items have already been displayed. At the
step S9 in Fig. 2B, therefore, items and numerical
values dependent on the specifications and performance
15 of the image pickup apparatus 400 are indicated with
characters, numerals, and pictures such as an icon.

The control means 60 in the information processing apparatus 300 instructs the image pickup control circuit 400 to initialize the image pickup means 402. In response to the instruction, the image pickup control circuit 440 resets flags and variables, turns on the power circuit 442, and initializes the components of the image pickup means (S63).

The control means 60 instructs the image pickup control circuit 440 to produce a through-mode display screen. In response to the instruction, the image pickup control circuit 440 transmits an image

10 (S64) .

15 (S76), and terminates the execution of the image pickup
program (S13).

The control means 60 determines whether the image data acquired by the image pickup apparatus 400 can be recorded in the memory means 62 or the recording medium 90 (S66). If recording cannot be done because a recordable empty area is unavailable or no recording medium is connected, the control means 60 display a warning on the display means 64 (S75), quits the viewfinder display screen (S76), and terminates the run of the image pickup program (S13). When terminating the run of the image pickup program, the control means 60 instructs the image pickup control circuit 440 to

1 terminate the operation of the image pickup means 402.
The image pickup control circuit 440 executes the
termination processing necessary for the components of
the image pickup means 402, and turns off the power
5 circuit 442.

When a recordable area is available (S66), if the distance measurement/photometry switch (SW1) is turned on (S67), the control means 60 instructs the image pickup control circuit 440 to execute distance measurement and photometry. The image pickup control circuit 440 allows the distance measuring circuit 434 and photometry circuit 436 to execute distance measurement and photometry, focuses the lens array 410 at an object, and determines a shutter speed (S68).

15 The control means 60 repeats the distance measurement and photometry (S68) until the distance measurement/photometry switch (SW1) and imaging switch (SW2) are turned on one after another using the operating means 66.

20 When the imaging switch (SW2) is turned on
using the operating means 66 (S69), the control means
60 determines whether the image data acquired by the
image pickup apparatus 400 can be recorded in the
recording medium 426 (S70). If the recording medium
25 426 has no recordable area, it is determined whether
the image data can be recorded in the memory means 62
in the information processing apparatus or the

1 recording medium 90 connected to the information
processing apparatus (S77). If recording cannot be
done because the memory means 62 or recording medium
90 has no empty area or the recording medium 90 is
5 disconnected, the control means 60 displays a warning
on the display means 64 (S74), and waits until the
imaging switch in the operating means 66 is pressed
(S65).

If the memory means 62 or recording medium 90 has a recordable empty area (S77), the control means 60 performs the setting of changing a medium in which acquired image data is recorded from the recording medium 426 to the memory means 62 or recording medium 90, and displays Setting Changed (S78).

15 If the recording medium 426 (S70) or the memory
means 62 or recording medium 90 has a recordable area
(S77 and S78), the control means 60 instructs the
image pickup control circuit 440 to execute photography.
The image pickup control circuit 440 executes photo-
20 graphy and writes image data in the image memory 424
(S71).

If the next photography is executed soon (S72), control is returned to the step S69. The aforesaid sequence is repeated.

25 If continuous photography is not executed or
the next photography is not performed because the
image memory 424 is full (S72), the control means 60

The recording at the step S73 and the photography at the step S71 may be executed in parallel with each other. If the distance measurement/photometry switch (SW1) is turned off using the control means 60 (S67), the control means 60 waits until the imaging switch in the operating means 66 is pressed (S65).

25 The sequences of the distance measurement and photometry to be executed at the step S68 in Fig. 7B and of the photography to be executed at the step S71 therein are identical to those in the first embodiment

1 described in conjunction with Figs. 4 and 5, of which
description will therefore be omitted.

The third embodiment of the present invention
will be described later.

5 Figs. 8A and 8B are block diagrams showing the
third embodiment of the present invention.

In Fig. 8A, reference numeral 500 denotes an
image pickup apparatus.

The image pickup apparatus 500 comprises an
10 image pickup means 502, a recording medium 526, an
interface 552, and a connector 554.

The recording medium 526 is a semiconductor
memory, magnetic tape, magnetic disk, magneto-optical
disk, or the like. The recording medium 526 may be
15 fixed to or demountable from the image pickup apparatus
500. Alternatively, the recording medium 526 may
comprise a plurality of recording media or a plurality
of types of recording media. Some of the recording
media may be fixed to the image pickup apparatus 500
20 and the remaining recording media may be demountable
therefrom.

The recording medium 526 comprises a recording
area 558 and a program storage means 550.

Reference numeral 550 denotes a program storage
25 means for storing programs each describing imaging for
the image pickup means 502. The stored programs are
run by the information processing apparatus 300.

5 The recording area 558 and program storage
means 550 are independent of each other in the
recording medium 526. Alternatively, the recording
area 558 and program storage means 550 may be provided
as a single unit. Part of the unit may be assigned to
0 recording of image data, and the other part thereof may
be assigned to storage of an imaging program. This
alternative poses no problem.

Referring to Figs. 2A, 2B, 4, 5, 9A and 9B,
the operation of the third embodiment will be described.
20 The sequence of a main routine in the third embodiment
is identical to that in the first embodiment described
in conjunction with the flowchart of Figs. 2A and 2B,
of which description will be omitted.

Figs. 9A and 9B are detailed flowcharts of the
25 imaging program to be run at the step S13 in Fig. 2B.
The description below will proceed on the assumption
that a data signal and a control signal will be

transferred between the control means 60 and image pickup control circuit 540 via the interface 72, connector 74, connector 75, and interface 552.

The control means 60 reads data (imaging information) inherent to the mounted image pickup apparatus 500 from a program stored in an area of the memory means 62 at the step S12 in Fig. 2B and written to operate the image pickup apparatus 500 (S81), and produces a display screen necessary for imaging on the display means 64 according to the read imaging information (S82).

The contents of the "display screen necessary for imaging" such as a position, a color, a frame and other items have already been displayed. At the step 15 S9 in Fig. 2B, therefore, items and numerical values dependent on the specifications and performance of the mounted image pickup apparatus 500; that is, the afore-said information are displayed using characters, numerals, and pictures such as an icon.

20 The control means 60 instructs the image pickup
control circuit 540 to initialize the image pickup
means 502. In response to the instruction, the image
pickup control circuit 540 resets flags and variables,
turns on the power circuit 542, and initializes the
25 components of the image pickup means 502 (S83).

The control means 60 instructs the image pickup control circuit 540 to produce a through-mode display

1 screen. In response to the instruction, the image
pickup control circuit 540 transmits an image formed
on the image pickup element 512 to the information
processing apparatus 300 through the A/D converter 516,
5 memory control circuit 520, image memory 524, memory
control circuit 520 again, interface 552, and connector
554. The control means 60 writes acquired image data
in the internal video memory of the display means 64
via the connector 74 and interface 72, reads the image
10 data, and displays it as a viewfinder display screen
on the display means 64 (S84).

If the imaging switch in the operating means 66
is off (S85), the control means 60 quits the imaging
display screen and viewfinder display screen on the
15 display means 64 (S96), and terminates the run of the
image pickup program (S13).

The control means 60 determines whether the
image data acquired by the image pickup apparatus 500
can be recorded in the memory means 62 or recording
20 medium 90 (S86). If recording cannot be done because
a recordable empty area is unavailable or no recording
medium is connected, the control means 60 displays a
warning on the display means 64 (S95), quits the
imaging and viewfinder display screens on the display
25 means 64 (S96), and terminates the run of the imaging
program (S13). When terminating the run of the
imaging program, the control circuit 60 instructs the

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- 1 image pickup control circuit 540 to terminate the
operation of the image pickup means 502. The image
pickup control circuit 540 executes the termination
processing required for the components of the image
5 pickup means 502, and turns off the power circuit 542.

When a recordable area is available (S86), if
an active switch (SW0) is turned on using the operating
means 66 (S100), the control means 60 sets the
viewfinder display screen to the through mode (S101).

- 10 When a distance measurement/photometry switch (SW1) is
turned on using the operating means 66 (S87), the
control means 60 instructs the image pickup control
circuit 540 to execute distance measurement and
photometry. The image pickup control circuit 540
15 allows the distance measuring circuit 534 and photo-
metry circuit 536 to execute distance measurement and
photometry, focuses the lens array 510 at an object,
and determines a shutter speed (S88).

- The control means 60 repeats the distance
20 measurement and photometry (S88) until the active
switch (SW0), the distance measurement/photometry
switch (SW1) and imaging switch (SW2) are turned on
one after another using the operating means 66 (S89).

- When the imaging switch (SW2) is turned on
25 using the operating means 66 (S89), the control means
60 determines whether the image data acquired by the
image pickup apparatus 500 can be recorded in the

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If the memory means 62 or recording medium 90 has a recordable empty area (S97), the control means 60 performs the setting of changing a medium in which acquired image data is stored from the recording medium 526 to the memory means 62 or recording medium 90, and displays Setting Changed (S98).

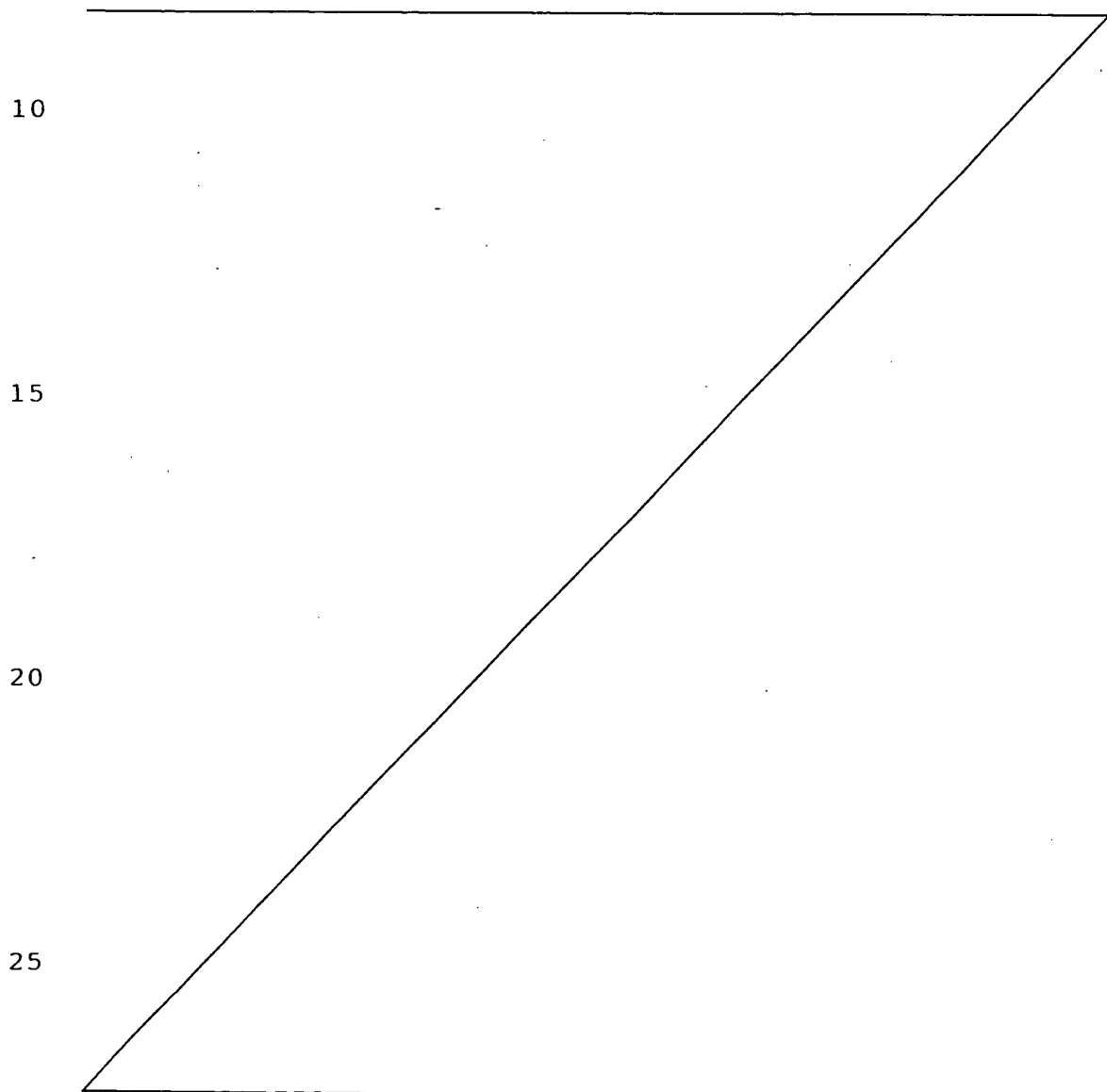
25 If the next photography is executed soon (S92), control is returned to the step S89. The aforesaid sequence is repeated.

If continuous photography is not executed or

20 When the active switch (SW0) is turned off
using the operating means 66 (S100) or the distance
measurement/photometry switch (SW1) is turned off
using the operating means 66 (S87), the control means
60 sets the viewfinder display screen to the monitor
25 mode (S99), and waits until the imaging switch in the
operating means 66 is pressed (S85). In this embodi-
ment, when the active switch is turned on, the monitor

1 mode is set up.

The sequences of the distance measurement/
photometry and imaging to be executed at the steps S88
and S91 in Fig. 9B are identical to those in the first
5 embodiment described in conjunction with the detailed
flowcharts of Figs. 4 and 5, of which description will
therefore be omitted.



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1 The fourth embodiment of the present invention
will be described below.

 Referring to Figs. 2A, 2B, 4, 5, 10A and 10B,
the operation of the fourth embodiment will be described.
5 In the fourth embodiment, a system having the
configuration shown in Figs. 8A and 8B operates
differently from that in the third embodiment. The
sequence of a main routine in this embodiment
representing the operation of this embodiment is
10 identical to that in the first embodiment described in
conjunction with Figs. 2A and 2B, of which description
will therefore be omitted.

 Figs. 10A and 10B are a detailed flowchart
showing the imaging program to be run at the step S13
15 in Fig. 2B. The description below will proceed on the
consumption that a data signal and a control signal
will be transferred between the control means 60 and
image pickup control circuit 540 via the interface 72,
connector 74, connector 554, and interface 552.

20 The control means 60 reads data (imaging
information) inherent to the mounted image pickup
apparatus 500 from a program stored in an area of the
memory means 62 at the step S12 in Fig. 2B and written
to operate the image pickup apparatus 500 (S111), and
25 produces a display screen necessary for imaging on the
display means 64 according to the read imaging
information (S112).

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1 The contents of the "display screen necessary
for imaging" such as a position, a color, a frame, and
other items have already been display. At the step S9
in Fig. 2B, therefore, items and numerical values
5 dependent on the specifications and performance of the
mounted image pickup apparatus 500 are displayed using
characters, numerals, and pictures such as an icon.

The control means 60 instructs the image pickup control circuit 540 to initialize the image pickup means 502. In response to the instruction, the image pickup control circuit 540 resets flags and variables, turns on the power circuit 542, and initializes the components of the image pickup means 502 (S113).

The control means 60 instructs the image pickup control circuit 540 to produce a through-mode display screen. In response to the instruction, the image pickup control circuit 540 transmits an image formed on the image pickup element 512 to the information processing apparatus 300 through the A/D converter 516, memory control circuit 520, image memory 524, memory control circuit 520 again, interface 552, and connector 554. The control means 60 writes the acquired image data in the internal video memory of the display means 64 via the connector 74 and interface 72, and reads the image data to display it as a viewfinder display screen on the display means 64 (S114).

When the imaging switch in the operating means

1 66 is off (S115), the control means 60 quits the
imaging and viewfinder display screens on the display
means 64 (S126), and terminates the run of the imaging
program (S13).

5 The control means 60 determines whether the
image data acquired by the image pickup apparatus 500
can be recorded in the memory means 62 or recording
medium 90 (S116). If recording cannot be done because
a recordable empty area is unavailable or no recording
10 medium is connected, the control means 60 displays a
warning on the display means 64 (S125), quits the
imaging and viewfinder display screens on the display
means 64 (S126), and terminates the run of the imaging
program (S13). When terminating the run of the image
15 pickup program, the control means 60 instructs the
image pickup control circuit 540 to terminate the
operation of the image pickup means 502. The image pickup
control circuit 540 executes the termination processing
required for the components of the image pickup means
20 502, and turns off the power circuit 542.

When a recordable area is available (S116), if
the active switch (SW0) is turned on using the
operating means 66 (S130), the control means 60 sets
the viewfinder display screen to the through mode
25 (S131). When the distance measurement/photometry
switch (SW1) is turned on using the operating means
66 (S117), the control means 60 instructs the image

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1 pickup control circuit 540 to execute distance
measurement and photometry. The image pickup control
circuit 540 allows the distance measuring circuit 534
and photometry circuit 536 to execute distance measurement
5 and photometry, focuses the lens array 510 at an object,
and determines a shutter speed (S118).

The control means 60 repeats distance
measurement and photometry (S118) until the active
switch (SW0), distance measurement/photometry switch
10 (SW1), and imaging switch (SW2) are turned on one after
another using the operating means 66 (S119).

When the imaging switch (SW2) is turned on
using the operating means 66 (S119), the control means
60 determines whether the image data acquired by the
15 image pickup apparatus 500 can be recorded in the
recording medium 526 (S120). If the recording medium
526 has no recordable area, the control means 60
determines whether the image data can be recorded in
the memory means 62 or recording medium 90 (S127).
20 If recording cannot be done because the memory means
62 or recording medium 90 has no recordable empty area
or the recording medium 90 is disconnected, the control
means 60 displays a warning on the display means 64
(S124), produces a through-mode display screen (S133)
25 or a monitor-mode display screen (S129) according to
the setting of the viewfinder display mode select
switch in the operating means 66 (S132), and waits

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1 until the imaging switch in the operating means 66 is
pressed (S115).

Either the through-mode display screen or monitor-mode display screen may be selected and displayed, or both thereof may be displayed according to the setting of the select switch. While both the through-mode display screen and monitor-mode display screen are being displayed, a selected one of them may be enlarged or located in the upper window.

10 When the memory means 62 or recording medium 90
has a recordable empty area (S127), the control means
60 performs the setting of changing a medium for use in
storing acquired image data from the recording medium
526 to the memory means 62 or recording medium 90, and
15 displays Setting Changed (S128).

When the recording medium 526 has a recordable area (S120) or the memory means 62 or recording medium 90 has a recordable area (S127 and S128), the control means 60 instructs the image pickup control circuit 540 to execute photography. The image pickup control circuit 540 executes photography and writes image data in the image memory 524 (S121).

If the next photography is executed soon (S122), control is returned to the step S119. The aforesaid processing is repeated.

If continuous photography is not executed or the next photography is not performed soon because the

When the active switch (SW0) is turned off
20 using the operating means 66 (S130) or the distance
measurement/photometry switch (SW1) is turned off
using the operating means 66 (S117), the control means
60 produces a through-mode display screen (S133) or a
monitor-mode display screen (S129) according to the
25 setting of the viewfinder display mode select switch in
the operating means 66 (S132), and waits until the
imaging switch in the operating means 66 is pressed

When the active switch (SW0) is turned off
20 using the operating means 66 (S130) or the distance
measurement/photometry switch (SW1) is turned off
using the operating means 66 (S117), the control means
60 produces a through-mode display screen (S133) or a
monitor-mode display screen (S129) according to the
25 setting of the viewfinder display mode select switch in
the operating means 66 (S132), and waits until the
imaging switch in the operating means 66 is pressed

1 (S115).

The sequences of the distance measurement and photometry and of the imaging to be executed at the steps S118 and S121 in Figs. 10A and 10B are identical
5 to those in the first embodiment described in conjunction with Figs. 4 and 5, of which description will therefore be omitted.

Fig. 11 is an oblique view showing the appearance of an embodiment of the image pickup apparatus 200
10 according to the present invention.

In the image pickup apparatus 200, the component elements necessary for the image pickup means 202 to effect imaging; such as, the lens array 10, distance measuring circuit 34, photometry circuit 36, white
15 balance metering circuit 46, and flash 38 are arranged in the opposite side of the connector 54. The apparatus of this embodiment of the present invention is characterized by the layout that when the image pickup apparatus 200 is mounted on the information processing
20 apparatus 300, the component elements required for imaging; such as, the lens array 10, distance measuring circuit 34, photometry circuit 36, white balance metering circuit 46, and flash 38 come out of the information processing apparatus 300.

25 Fig. 12 is an oblique view showing the appearance of an embodiment of the image pickup apparatus 500 according to the present invention.

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1 In the image pickup apparatus 500, the recording
medium 526 is located near the connector 554 and the
image pickup means 502 is located on the opposite side
of the connector 554. In this embodiment of the
5 present invention, when the image pickup apparatus 500
is mounted on the information processing apparatus 300,
the component elements required for imaging such as,
the lens array 510, distance measuring circuit 534,
photometry circuit 536, white balance metering circuit
10 546, and flash 538 come out of the information processing
apparatus 300.

Figs. 13 and 14 are oblique views showing the
appearances of embodiments of the imaging system of the
present invention.

15 In Fig. 13, a portable computer is used as the
information processing apparatus 300.

In the apparatus of this embodiment, the display
means 64 displays a screen showing a state of the image
pickup means 202 and an operating procedure and a screen
20 showing a viewfinder in the through mode and/or monitor
mode. The operating means 66 independent of or united
with the display means 64 is used to operate the image
pickup means 202 and achieve imaging. In general,
information is entered at the operating means 66 using
25 keys or switches. Information in a display screen on
the display means 64 may be selected using a pointing
device such as a pen, mouse, trackball, touch-sensitive

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1 panel, or line-of-sight sensor, and provided as
information entered at the operating means 66.

In Fig. 14, a portable wireless telephone is
used as the information processing apparatus 300.

5 The display means 64 displays a screen showing
a state of the image pickup means 202 and an operating
procedure and a screen showing a viewfinder in the
through mode and/or monitor mode. In this embodiment,
the display screen showing a state and an operating
10 procedure appears in the lower window, and the viewfinder
display screen appears in the upper window. In addition
to these two windows, another window may be created to
show both the through-mode and monitor-mode display
screens simultaneously. The operating means 66
15 independent of or united with the display means 64 is
used to operate the image pickup means 202 and achieve
imaging. In general, information is entered at the
operating means 66 using keys and switches. Information
in a display screen on the display means 64 may be
20 selected using a pointing device such as a pen, mouse,
trackball, touch-sensitive panel, or line-of-sight
sensor, and supplied as information entered at the
operating means 66.

When the information processing apparatus 300
25 is set to a state suitable for imaging, the imaging
switch may be turned on. When the information
processing apparatus 300 is set to a state suitable for

1 communication such as telephoning, the imaging switch
may be turned off. For example, in Fig. 14, when the
information processing apparatus 300 is angled by more
than 90° and postured so as to lie close to a user's
5 face for convenient speech, it is determined that the
system is used as a telephone and the imaging switch
is turned off. On the other hand, when the information
processing apparatus 300 is angled by about 90° and
postured so as to be convenient for a user to perform
10 imaging by looking at the viewfinder display screen, it
is determined that the system is used for imaging and
the imaging switch is turned on. The imaging switch
should be located near the hinge of the information
processing apparatus 300 and designed to be on or off
15 according to the open angle of the information processing
apparatus 300. This enables more effective use of the
system of this embodiment.

Using Figs. 1A, 1B, 6A, 6B, 8A and 8B, the
embodiments of the present invention have been
20 described. The recording medium 90 or recording medium
526 may be any of a semiconductor memory, a magnetic
disk, a micro-digital audio tape, a magneto-optical
disk, and an optical disk, which causes no problem.

The recording medium 90 and recording medium
25 526 may be formed as a composite medium made by uniting
a semiconductor memory with a magnetic disk, which poses
no problem. Moreover, the semiconductor of the composite

1 medium memory may be detachable from and freely
connectable to the main unit of the composite medium.
This causes no problem, either. On the contrary, the
magnet disk of the composite may be detachable from and
5 freely connectable to the main unit of the composite
medium. This causes no problem. Needless to say, the
composite medium may be composed not only of a
semiconductor memory and a magnetic disk but also of
two or more of a semiconductor memory, a magnetic disk,
10 a micro-digital audio tape, a magneto-optical disk, and
an optical disk, which causes no problem.

The description of the embodiments has proceeded
on the assumption that the recording medium 90 is
independent of and freely connectable to the main unit
15 of the information processing apparatus. Alternatively,
the recording medium 90 may be fixed to the main unit.
This causes no problem.

Two or more recording media 90 may be connected
to the information processing apparatus, which poses
20 no problem. One or more recording media 90 may be
fixed to the main unit of the information processing
apparatus, and one or more recording media 90 may be
freely connectable thereto. This poses no problem,
either.

25 The communication means 100 lies independently
of and freely connectable to the main unit of the
information processing unit. Alternatively, the

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1 communication means 100 may be fixed to the main unit
thereof. Needless to say, no problem occurs.

A configuration in which two or more
communication means 100 are connected to the information
5 processing apparatus poses no problem. A configuration,
in which one or more communication means 100 are fixed
to the main unit of the information processing
apparatus and one or more communication means 100 are
freely connectable to the main unit thereof, is also
10 acceptable.

The image pickup apparatus 200 comprises the
image pickup means 202 and the program storage means
50 for storing programs each describing imaging for the
image pickup means 202. The image pickup apparatus 200
15 may further include a sound recording means and
program storage means for storing programs written for
sound recording. This causes no problem. In this case,
when a program for imaging is read from the program
storage means 50, a program for sound recording is also
20 read at the same time. Both the programs are run by
the information processing apparatus 300 so that both
imaging and sound recording are carried out simultaneously.
The same applies to the image pickup apparatus 400 and
image pickup apparatus 500.

25 The operating and displaying facilities of the
information processing apparatus 300 can be modified
according to a mounted image pickup apparatus. A need

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1 for an image pickup apparatus having higher performance
and better specifications can be satisfied merely by
replacing an image pickup apparatus with a new one.
Thus, imaging can be achieved without replacing the
5 information processing apparatus 300. Even if an image
pickup apparatus to be mounted differs from a previous
one in terms of the lens zoom facility, flash, shutter,
distance measurement/photometry facility, color
reproducibility, resolution, dynamic range, photographic
10 speed, storage capacity of the image memory 24,
capability of the compression/extension circuit 22,
capacity of a battery, the operating and displaying
facilities of the information processing apparatus 300
should be modified merely by running a program stored
15 in the program storage means and associated with the
image pickup apparatus.

As easily understood from the above description, according to the present embodiment, an image pickup apparatus having an image pickup means and a program storage means is demountable from an information processing apparatus having operating means, display means, memory means, control means, and an image pickup apparatus detachment detecting means. This results in an image processing system offering excellent portability and enabling easy photography.

A facility for determining the contents of a display screen on display means according to the output

1 of the image pickup apparatus detachment detecting
means may be included in a system. This results in an
image processing system offering excellent portability
and enabling easy photography.

5 The output of the image pickup apparatus
detachment detecting means is a signal indicating that
the image pickup apparatus is unconnected. The facility
for determining the contents of a display screen on the
display means is a facility for disabling the display of
10 an image currently being picked up by the image pickup
means. This results in an image processing system
offering excellent portability and enabling easy
photography.

Photography can be enabled when an image pickup
15 apparatus having an image pickup means and a program
storage means is mounted on an information processing
apparatus having an operating means, a display means, a
memory means, and a control means. This results in an
image processing system offering excellent portability
20 and enabling easy photography.

While an image pickup means is executing
photography, an output image of the image pickup means
is displayed on the display means. When the image pickup
means has stopped photography, an output image of the
25 memory means is displayed on the display means. This
results in an image processing system offering excellent
portability and enabling easy photography.

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When an image pickup apparatus is mounted in an information processing apparatus, the facilities of the image pickup means employed for photography come out of the information processing apparatus. This results in an image processing system offering excellent portability and enabling easy photography.

Another embodiment of the present invention will
20 be described with reference to the drawings.

Reference numeral 54' denotes a connector for
25 use in transferring a data signal and a control signal
to or from the information processing apparatus 300 and
supplying power to the interface 52 and program storage

1 means 50.

Reference numeral 42' denotes a power control circuit. 44' denotes a battery. The power control circuit 42' comprises a battery load detector, a battery voltage detector, a DC-DC converter, and a switch or the like for selecting a block to be energized. The power control circuit 42' detects the presence or absence of the battery 44', the type of the battery 44', and an amount of power remaining in the battery 44'. Based on the result of the detection and an instruction sent from an image pickup control circuit 40', the power control circuit 42' controls the DC-DC converter and supplies required voltages to the components of the image pickup apparatus 200 for a required time interval. The power control circuit 42' is connected to a power control circuit 68' in the information processing apparatus 300 via a connector 54' and a connector 74'. A control signal, various voltages, and various currents are transferred between the power control circuit 42' and the power control circuit 68'. The battery 44' is a chargeable secondary battery and charged with a current supplied by the information processing apparatus 300 via the connector 54'. On the contrary, the battery 44' may supply a current to the information processing apparatus via the connector 54'. The battery 44' is designed to cope with a peak current occurring in charging a flash 38' of the

1 image pickup apparatus 200, and driving a motor for the
shutter drive circuit 30 and lens drive circuit 32.

The battery 44' may be a primary or secondary battery,
or composed of primary and secondary batteries. The
5 battery 44' may be provided in an exchangeable style, a
style in which the battery 44' is fixed to the image
pickup apparatus 200, or in a style in which part of
the battery 44' is fixed and the remaining part thereof
is exchangeable.

10 The image pickup control circuit 40' controls,
similarly to the one in the previous embodiment, the
lens array 10 by driving the focusing lens in the lens
array 10 using the lens drive circuit 32 according to
the result of measurement provided by the distance
15 measuring circuit 34, thus bringing the lens array 10
into focus. Based on the result of photometry provided
by the photometry circuit 36, the image pickup control
circuit 40' determines a shutter speed or a time
interval for keeping the shutter 13 open using the
20 shutter drive circuit 30 so as to optimize an exposure
value.

Reference numeral 84' denotes a detachable power
supply. 68' denotes a power control circuit. 70'
denotes a battery. The power control circuit 68'
25 comprises a battery load detector, a battery voltage
detector, a DC-DC converter, and a switch or the like
for selecting a block to be energized. The power control

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Reference numeral 80 denotes a connector for use in transferring a data signal and a control signal to or from the communication means 100 and supplying power to the communication means 100.

25 When the power supply of the information
processing apparatus 300 is turned on or a new battery
is loaded in the information processing apparatus 300,

5 threshold level for use in detecting a voltage (S1).

15 may compare the value of a voltage measured by the power
control circuit 68' with the value of the threshold
level.

20 66 is on (S3), the control means 60' places the power
control circuit 68' in a power-on state (S4).

25 warning on the display means 64 (S5), executes the
termination processing required for the components of
the information processing apparatus 300, for example,

The control means 60' instructs the image pickup apparatus detachment detecting means 82 to determine whether the image pickup apparatus 200 is connected to the information processing apparatus 300 (S7).

15 Depending on whether the image pickup apparatus 200 is connected or not, the threshold level used for voltage detection is set to a value for the image pickup mode (S8) or a value for the information processing mode (S17). The threshold level value is stored in

20 the internal register of the control means 60 or part of the memory means 62.

When the image pickup apparatus is connected, the threshold level is set to a higher value than that when the image pickup apparatus is unconnected. This is because when the image pickup apparatus is connected, power may be supplied to the image pickup apparatus from the battery 70'. The threshold level is therefore set

1 to a higher value.

When the imaging switch in the operating means 66 is off (S9) or the threshold level used for voltage detection is set to the value for the information processing mode (S17), the control means 60' produces a predetermined necessary display screen on the display means 64 using characters, numerals, and pictures such as an icon so as to receive information entered at the operating means 66.

10 When a command is entered at the operating means 66 (S18), the control means 60' executes predetermined processing associated with the command for the information processing apparatus 300 (S19). When the predetermined processing terminates, the control means 15 60' produces a predetermined necessary display screen on the display means 64 using characters, numerals, and pictures including an icon so as to receive information entered at the operating means 66. Control is then returned to the step S2.

20 When the imaging switch in the operating means 66 is on (S9), the control means 60' instructs the power control circuit 68' to determine whether the voltage of the power supply 84' is high enough for the information processing apparatus 300 and image pickup 25 apparatus 200 to operate (S10).

If the voltage of the power supply 84' is not high enough for the information processing apparatus 300

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1 and image pickup apparatus 200 to operate (S10), the
control means 60' displays a warning on the display
means 64 (S16), and then passes control to the step
S15.

5 If the voltage of the power supply 84' is high
enough for the information processing apparatus 300 and
image pickup apparatus 200 to operate (S10), the control
means 60 reads a program describing how to operate the
10 image pickup apparatus 200 from the program storage
means 50, and stores the program in an area of the
memory means 62 via the interface 52, connector 64,
connector 74, and interface 72 (S11).

The control means 60 sets a value as the
threshold levels used for voltage detection in the
15 power control circuit 42' according to the data inherent
to the image pickup apparatus 200 read together with the
program (S12). The threshold level is used to determine
whether the voltage of the battery 44' is high enough
for the image pickup apparatus 200 to operate in various
20 image pickup modes. The threshold level is set to a
plurality of values associated with the modes.

The control means 60' places the power control
circuit 42' in the image pickup apparatus 200 in the
power-on state (S13), reads a program describing how to
25 operate the image pickup apparatus 200 from the memory
means 62, and runs the program (S14). With the run of
the program, the control means 60' produces a

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1 predetermined display screen necessary for imaging on
the display means 64, sequentially actuates the
components of the image pickup apparatus 200 according
to commands entered at the operating means 66, and thus
5 achieves imaging.

When all imaging operations are completed, the control means 60' terminates the execution of the image pickup mode, places the power control circuit 42' in the image pickup apparatus 200 in the power-off state (S15), produces a predetermined necessary display screen on the display means 64 using characters, numerals, and pictures including an icon so as to receive information entered at the operating means 66, and then returns control the step S2.

15 Figs. 17A and 17B are detailed flowcharts of
the imaging program to be run at the step S14 in Figs.
16B. The description below will proceed on the
assumption that a data signal and a control signal
will be transferred between the control means 60' and
20 image pickup control circuit 40' via the interface 72,
connector 74', connector 54', and interface 52.

The control means 60' produces a predetermined display screen necessary for imaging on the display means 64, and instructs the image pickup control circuit 40 to execute predetermined necessary start processing, for example, start processing of initializing the components of the image pickup means 202 (S21).

1 In the "predetermined display screen necessary
for imaging" produced on the display means 64, as
mentioned previously, for example, an operation mode
of the image pickup apparatus 200 such as a single
5 photography mode, a continuous photography mode, a
self-timer photography mode, information concerning
distance measurement and photometry, an operating
state of the flash 38, an amount of power remaining in
the battery 44', a shutter speed, an f-number, an
10 exposure correction value, a gain-up state for improving
the sensitivity of the image pickup element, a use state
of the image memory 24, an operating state of the
compression/extension circuit 22, a recording state of
the recording medium 90, the number of exposed frames, a
15 storage capacity for exposed image data, the number of
remaining frames, and a storage capacity for remaining
image data are displayed using characters, numerals,
and pictures including an icon. The facilities of the
image pickup apparatus 200 may be displayed on the
20 display means 64 as pictures showing a release button,
an electronic dial, and a mode select dial in the
operating unit of an ordinary camera. The pictures
of the components of the operating unit of a camera
displayed on the display means 64 may be selectively
25 provided as information entered at the operating means
66 using a pointing device such as a pen, a mouse, a
trackball, a touch-sensitive panel, or a line-of-sight

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When the imaging switch in the operating means
10 66 is off (S22), the control means 60' instructs the
image pickup control circuit 40' to execute the
predetermined termination processing necessary for the
image pickup apparatus 200 (S35), quits the imaging
and viewfinder display screens on the display means 64,
15 and terminates the run of the imaging program (S14).

When the imaging switch in the operating means is on (S22), the control means 60' instructs the image pickup control circuit 40' to execute voltage detection. The image pickup control circuit 40 instructs the power control circuit 42' to check if the voltage of the battery 44' is high enough for the image pickup apparatus 200 to operate, and informs the control means 60' of the finding (S23). In the voltage detection at the step S23, it must be determined whether the voltage is high enough for distance measurement and photometry which will be described later (S25).

1 If the power control circuit 42' detects that
the voltage of the battery 44' is not high enough for
the image pickup apparatus 200 to operate (S23), the
control means 60' displays a warning on the display
5 means 64 (S34), instructs the image pickup control
circuit 40' to execute the predetermined termination
processing necessary for the image pickup apparatus
200 (S35), quits the imaging and viewfinder display
screens on the display means 64, and terminates the
10 run of the imaging program (S14).

When the voltage of the battery 44' is high
enough for the image pickup apparatus 200 to operate
(S23), if the distance measurement/photometry switch
(SW1) is turned on using the operating means 66 (S24),
15 the control means 60' instructs the image pickup control
circuit 40' to execute distance measurement and
photometry. The image pickup control circuit 40'
allows the distance measuring circuit 34 and photometry
circuit 36 to execute distance measurement and
20 photometry, focuses the lens array 10 at an object,
and determines a shutter speed (S25). The distance
measurement and photometry are identical to those
described in detail previously.

The control means 60' repeats the distance
25 measurement and photometry (S25) until the distance
measurement/photometry switch (SW1) is turned on using
the operating means 66, the voltage of the battery 44'

15 If the voltage of the battery 44' is not high
enough for the image pickup apparatus 200 to operate
(S26), the control means 60' displays a warning on the
display means 64 (S34), instructs the image pickup
control circuit 40' to execute the predetermined
20 termination processing necessary for the image pickup
apparatus 200 (S35), quits the imaging and viewfinder
display screens on the display means 64, and terminates
the run of the imaging program (S14).

When the voltage of the battery 44' is high
25 enough for the image pickup apparatus 200 to operate
(S26), if the imaging switch (SW2) is turned on using
the operating means 66 (S27), the control means 60'

1 determines whether the image data acquired by the
image pickup apparatus 200 can be recorded in the
memory means 62 or recording medium 90 (S28). If
recording cannot be done because a recordable empty
5 area is unavailable or the recording medium is
disconnected, the control means 60 displays a warning
on the display means 64 (S33) and waits until the
imaging switch in the operating means 66 is pressed
(S22).

10 If a recordable area is available (S28), the
control means 60' instructs the image pickup control
circuit 40' to execute photography. The image pickup
control circuit 40' executes photography and writes
image data in the image memory 24 (S29). The
15 photography will be described in detail later.

When the next photography is executed soon
(S30), if the voltage of the battery 44' is high enough
for the image pickup apparatus 200 to operate (S31),
control is returned to the step S26. The aforesaid
20 processing is repeated. In the voltage detection at the
step S31, it must be determined at least whether the
voltage of the battery 44' is high enough for recording
which will be described later (S32). The voltage
detection at the step S31 is achieved when the control
25 means 60' instructs the image pickup control circuit
40' to execute voltage detection, and the image pickup
control circuit 40' instructs the power control circuit

When continuous photography is not executed or the next photography is not performed soon because the image memory 24 is full (S30), or when the voltage of the battery 44' is not high enough for the image pickup apparatus 200 to operate (S31), the control means 60' instructs the image pickup control circuit 40' to execute recording. The image pickup control circuit 40' reads image data from the image memory 24, and sends the image data to the information processing apparatus 300 via the memory control circuit 20, interface 52, and connector 54. The control means 60' writes the received image data in the memory means 62 via the connector 74 and interface 72. The control means 60' may also write the received image data in the recording medium 90 via the interface 76 and connector 78 (S32). Control is then returned to the step S26.

After the distance measurement/photometry switch (SW1) is turned off using the operating means 66, the control means 60' waits until the imaging switch in the operating means 66 is pressed (S22).

25 The sequences of distance measurement and
photometry to be executed in the step S25 in Fig. 17B
are identical to those described in detail in

1 conjunction with Figs. 4 and 5.

Fig. 18 is a detailed flowchart of information processing to be executed at the step S19 in Fig. 16B.

The control means 60' executes predetermined start processing required for executing instructed information processing; such as, initialization (S61), and instructs the power control circuit 68' to determine whether the voltage of the power supply 84' is high enough for the information processing apparatus 300 to execute information processing (S62). For detection of a voltage, the control means 60' may set a value as a threshold level used for voltage detection in the power control circuit 68', and check the result of the voltage detection to made determination. Alternatively, the control means 60' may compare the value of a voltage measured by the power control circuit 68' with the value of the threshold level.

If the voltage of the power supply 84' is not high enough to execute the instructed information processing (S62), the control means 60' displays a warning on the display means 64 (S66), executes the termination processing required for the components of the information processing apparatus 300, for example, quitting of the display screen on the display means 64 (S65), and then terminates the execution of the information processing (S19).

If the voltage of the power supply 84' is high

1 enough to execute the instructed information processing
(S62), the control means 60' executes the instructed
information processing (S63). When the information
processing is executed continuously (S64), control is
5 returned to the step S62.

If the information processing is discontinued
(S64), the control means 60' executes the termination
processing required for the components of the information
processing apparatus 300, for example, quitting of the
10 display screen on the display means 64 (S65), and then
terminates the execution of the information processing
(S19).

(Another embodiment)

The sixth embodiment of the present invention
15 will be described below.

Referring to Figs. 19, 20A and 20B, the
operation of the sixth embodiment will be described.
Figs. 20A and 20B are a flowchart of a main routine in
the sixth embodiment.

20 In Figs. 20A and 20B, when the power supply of
the information processing apparatus 300 is turned on or
a new battery is loaded in the information processing
apparatus 300, the control means 60' resets flags and
control variables, runs a control program stored in an
25 area of the memory means 62; such as, an operating
system, and resets a threshold level (S81).

The control means 60' instructs the power control

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1 circuit 68' to determine whether the voltage of the
power supply 84' is high enough for the information
processing apparatus 300 to operate (S82). For
detection of a voltage, the control means 60' may set
5 a value as the threshold level used for voltage
detection in the power control circuit 68' and check the
result of the voltage detection provided by the power
control circuit 68' to make determination. Alternatively,
the control means 60' may compare the value of a voltage
10 measured by the power control circuit 68 with the value
of the threshold level.

When the voltage of the power supply 84' is
high enough (S82), if the main switch in the operating
means 66 is on (S83), the control means 60' places the
15 power control circuit 68' in a power-on state (S84).

If the voltage of the power supply 84' is not
high enough for the information processing apparatus
300 to operate (S82), the control means 60' displays a
warning on the display means 64 (S85), executes the
20 termination processing required for the components of
the information processing apparatus 300, for example,
quitting of the display screen on the display means 64,
places the power control circuit 68 in a power-off
state (S86), and then returns control to the step S82.
25 When the main switch in the operating means 66 is off
(S83), the control means 60' executes the termination
processing required for the components of the information

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1 processing apparatus 300, for example, quitting of the
display screen on the display means 64, places the
power control circuit 68 in the power-off state (S86),
and then returns control to the step S82.

5 When the image pickup apparatus detachment
detecting means determines that the image pickup
apparatus 200 is connected to the information processing
apparatus 300 (S87), if the imaging switch in the
operating means 66 is on (S88), the control means 60'
10 sets the threshold level used for voltage detection to
a value for an imaging mode (S89). The threshold level
value is stored in the internal register of the control
means 60' or part of the memory means 62.

15 When the image pickup apparatus detachment
detecting means 82 determines that the image pickup
apparatus 200 is not connected to the information
processing apparatus 300 (S87) or the imaging switch in
the operating means is off (S88), the control means 60'
produces a predetermined necessary display screen on the
20 display means 64 using characters, numerals, and
pictures including an icon so as to receive information
entered at the operating means 66.

25 When a communication switch is turned on using
the operating means 66 (S97), the control means 60' sets
the threshold level used for voltage detection to a value
for a communication mode (S98), and executes predetermined
communication processing for the information processing

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1 apparatus 300 (S99). When the predetermined
communication processing terminates, the control means
60' produces a predetermined necessary display screen
on the display means 64 using characters, numerals, and
5 pictures including an icon so as to receive information
entered at the operating means 66, and then returns
control to the step S82. The communication processing
will be described in detail later.

When the communication switch is not turned on using the operating means 66 (S97), the control means 60' sets the threshold level for voltage detection to a value for an information processing mode (S100). When a command is entered at the operating means 66 (S101), the predetermined processing associated with the command is executed for the information processing apparatus 300 (S102). When the predetermined processing terminates, a predetermined necessary display screen is produced on the display means 64 using characters, numerals, and pictures including an icon so that information entered at the operating means 66 can be received. Control is then returned to the step S82.

When the threshold level for voltage detection is set to the value for the imaging mode (S89), the control means 60' instructs the power control circuit 68' to determine whether the voltage of the power supply 84' is high enough for the information processing apparatus 300 and image pickup apparatus 200 to operate

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When all the image pickup operations are completed, the control means 60' terminates the execution of the image pickup mode, places the power control circuit 42' in the image pickup apparatus 200 in the power-off state (S95), produces a predetermined necessary display screen on the display means 64 using characters, numerals, and pictures including an icon so as to receive information entered at the operating means 66, and then returns control to the step S82.

Fig. 19 is a detailed flowchart of the communication processing to be executed at the step S99 in Fig. 20B.

The control means 60' places the power control
25 circuit 68' in a communication power-on state to supply
required voltages and currents to the communication means
100 (S71).

1 The control means 60' executes predetermined
start processing required to execute communication
processing; such as, initialization (S72), and instructs
the power control circuit 68' to determine whether the
5 voltage of the power supply 84' is high enough for the
information processing apparatus 300 to execute the
communication processing (S73). For detection of a
voltage, the control means 60' may set a value as a
threshold level used for voltage detection in the power
10 control circuit 68' and check the result of the voltage
detection provided by the power control circuit 68 to
made determination. Alternatively, the control means
60' may compare the value of a voltage measured by the
power control circuit 68' with the value of the
15 threshold level.

 If the voltage of the power supply 84' is
not high enough to execute communication processing
(S73), the control means 60' displays a warning on the
display means 64 (S78), executes the termination
20 processing required for the components of the
information processing apparatus 300; such as, quitting
of the display screen on the display means 64 (S77),
and then terminates the execution of the communication
processing (S99).

25 If the voltage of the power supply 84' is high
enough to execute communication processing (S73), the
control means 60' executes the communication processing

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1 (S74). For continuous execution of the communication
processing (S75), control is returned to the step S73.

When the communication processing is discontinued
(S75), the control means 60' executes the termination
5 processing required for the components of the information
processing apparatus 300; such as, quitting of the
display screen on the display means 64, places the
power control circuit 68' in a communication power-off
state to stop the supply of voltages and currents to
10 the communication means 100 (S77), and terminates the
execution of the communication processing (S99).

The third embodiment of the present invention
will be described below.

Referring to Figs. 21 and 22, the operation of
15 the seventh embodiment will be described. Figs. 21 and
22 are flowcharts of a main routine in the seventh
embodiment.

When the power supply of the information
processing apparatus 300 is turned on or a new battery
20 is loaded in the information processing apparatus 300,
the control means 60' resets flags and control
variables, and runs a control program stored in an
area of the memory means 62; such as, an operating
program. The control means 60' resets a threshold
25 level used for voltage detection (S111).

The control means 60' instructs the power
control circuit 68' to determine whether the voltage

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1 of the power supply 84' is high enough for the
information processing apparatus 300 to operate (S112).
For detection of a voltage, the control means 60' may
set a value as a threshold level for voltage detection
5 in the power control circuit 68' and check the result
of detection provided by the power control circuit 68'
to make determination. Alternatively, the control
means 60' may compare the value of a voltage measured
by the power control circuit 68' with the value of the
10 threshold level.

If the voltage of the power supply 84' is high
enough for the information processing apparatus 300 to
operate (S112), control is passed to a step S116.

15 If the voltage of the power supply 84' is not high
enough for the information processing apparatus 300 to
operate (S112), the control means 60' instructs the
image pickup apparatus detachment detecting means 82
to determine whether the image pickup apparatus 200 is
connected to the information processing apparatus 300
20 (S113). If it is determined that the image pickup
apparatus 200 is connected to the information
processing apparatus 300, the power control circuit 42'
detects the voltage of the battery 44' in the image
pickup apparatus 200 (S114).

25 If the voltage of the battery 44' is high
enough for the information processing apparatus 300 to
operate (S114), the control means 60 switches power

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1 supplies to select the battery 44 so that required
voltages and currents are supplied to the components of
the information processing apparatus 300 via the power
control circuit 42, connector 54, connector 74, and
5 power control circuit 68' (S115).

If the image pickup apparatus 200 is not
connected to the information processing apparatus 300
(S113) or the voltage of the battery 44' is not high
enough for the information processing apparatus 300 to
10 operate (S114), the control means 60' displays a warning
on the display means 64 (S115), executes the termination
processing required for the components of the information
processing apparatus 300, for example, quitting of the
display screen on the display means 64, places the
15 power control circuits 68' and 42' in the power-off
state (S119), and then returns control to the step
S112.

If the voltage of the power supply 84' is high
enough (S112) or power supplies are switched (S115),
20 the control means 60' waits until the main switch in the
operating means 66 is pressed (S116).

When the main switch in the operating means
66 is on (S116), the control means 60' places the power
control circuit 68' in the power-on state (S117). On
25 the contrary, when the main switch in the operating
means 66 is off (S116), the control means 60' places
the power control circuit 68' in the power-off state

1 (S119) and returns control to the step S112.

In the sequence of Fig. 22, when the voltage of the power supply 84' is high enough if it is determined that power supplies are not switched to select the power supply 84' to the battery 44' (S120), the control means 60' instructs the image pickup apparatus detachment detecting means 82 to determine whether the image pickup apparatus 200 is connected to the information processing apparatus 300 (S121).

10 When the image pickup apparatus detachment
detecting means 82 determines that the image pickup
apparatus 200 is connected to the information processing
apparatus 300 (S121), if the imaging switch in the
operating means 66 is on (S122), the control means 60'
15 sets the threshold level for voltage detection to a
value for an imaging mode (S123).

When the image pickup apparatus detachment detecting means 82 determines that the image pickup apparatus 200 is not connected to the information processing apparatus 300 (S121), or when the imaging switch in the operating means 66 is off (S122), the control means 60' sets the threshold level for voltage detection to a value for an information processing mode (S130).

25 When the voltage of the power supply 84' is not
high enough, if it is determined that power supplies
have been switched to select the battery 44' (S120),

When the threshold level for voltage detection
25 is set to the value for the imaging mode (Sl23), the
control means 60' instructs the power control circuit
68' to determine whether the voltage of the power supply

The control means 60' places the power control circuit 42' in the image pickup apparatus 200 to the power-on state (S127), reads a program describing how to operate the image pickup apparatus 200 from the memory means 62, and runs the program (S128). With the

1 run of the program, the control means 60' produces a
predetermined display screen necessary for imaging on
the display means 64, sequentially actuates the
components of the image pickup apparatus 200 according
5 to the commands entered at the operating means 66, and
thus achieves imaging.

When all the image pickup operations are
completed, the control means 60' terminates the
execution of the imaging mode, places the power control
10 circuit 42' in the image pickup apparatus 200 in the
power-off state (S129), produces a predetermined
necessary display screen on the display means 64 using
characters, numerals, and pictures including an icon so
as to receive information entered at the operating
15 means 66, and returns control to the step S112.

The sequences of the image pickup program to
be run at the step S128 in Fig. 10B and the information
processing to be executed at the step S134 are
identical to those in the first embodiment described
20 in conjunction with the flowcharts of Figs. 3A, 3B, 6A
and 6B, of which description will therefore be omitted.

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The operation of the embodiment having the configuration shown in Figs. 23A and 23B will be described in conjunction with Figs. 24 and later.

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If the command indicates the execution of the
15 imaging mode (S3), the control means 60 determines
whether the image pickup apparatus 200 is connected to
the information processing apparatus 300 (S4). If the
image pickup apparatus 200 is not connected, the control
means 60 displays a predetermined warning on the display
20 means 64 (S8) and waits for the input of the next
command (S2).

If the image pickup apparatus 200 is connected to the information processing apparatus 300, the control means 60 reads a program describing how to operate the image pickup apparatus 200 from the program storage means 50, and stores the program in an area of the memory means 62 via the interface 52, connector 54,

1 connector 74, and interface 72 (S5).

The control means 60 reads a program describing how to operate the image pickup apparatus 200 from the memory means 62 and runs the program (S6). With the run of the program, the control means 60 produces a predetermined display screen necessary for imaging on the display means 64, sequentially actuates the components of the image pickup apparatus 200 according to the commands entered at the operating means 66, and thus achieves imaging.

When all the image pickup operations are completed, the control means 60 terminates the execution of the imaging mode, produces a predetermined required display screen on the display means 64 using 15 characters, numerals, and pictures including an icon so as to receive information entered at the operating means 66, and then waits for the input of the next command (S2).

Fig. 25 is a detailed flowchart of the image
20 pickup program to be run at the step S6 in Fig. 24.

The description below will proceed on the assumption that a data signal and a control signal are transferred between the control means 60 and image pickup control circuit 40 via the interface 72, connector 74, connector 54, and interface 52.

The control means 60 produces a predetermined display screen necessary for imaging on the display

1 means 64 (S11). For example, as described previously,
an operation mode of the image pickup apparatus 200
such as a single photography mode, a continuous
photography mode, or a self-timer photography mode,
5 information concerning distance measurement and
photometry, an operating state of the flash 38, an
amount of power remaining in the battery 44, a shutter
speed, an f-number, an exposure correction value, a
state of gain-up operation for improving the sensitivity
10 of the image pickup element, a use state of the image
memory 24, an operating state of the compression/
extension circuit 22, a recording state of the recording
medium 90, the number of exposed frames, a storage
capacity for exposed image data, the number of remaining
15 frames, and a storage capacity for remaining image
data are displayed on the display means 64 using
characters, numerals, and pictures including an icon.
The facilities of the image pickup apparatus 200 may
be displayed on the display means 64 as pictures of a
20 release button, an electronic dial, a mode select
dial, and other components in an operation unit of an
ordinary camera. The pictures of the components of
the operation unit may be selectively provided as
information entered at the operating means 66 using
25 a pointing device such as a pen, mouse, trackball, or
touch-sensitive panel. Owing to these facilities,
the information processing apparatus 300 can be handled

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1 to achieve photography in the same manner as a camera
without unnaturalness.

The control means 60 instructs the image pickup control circuit 40 to initialize the image pickup means 210. In response to the instruction, the image pickup control circuit 40 resets flags and variables, turns on the power circuit 42, and initializes the components of the image pickup means 210 (S12).

The control means 60 determines whether image data acquired by the image pickup apparatus 200 can be recorded in the memory means 62 or recording medium 90 (S13). If recording cannot be done because a recordable empty area is unavailable or no recording medium is connected, the control means 60 displays a warning on the display means 64 (S24) and terminates the run of the imaging program (S6). When terminating the run of the imaging program, the control means 60 instructs the image pickup control circuit 40 to terminate the operation of the image pickup means 210. The image pickup control circuit 40 executes the termination processing required for the components of the image pickup means 210, and turns off the power circuit 42.

When the distance measurement/photometry switch
25 (SW1) is turned on using the operating means 66 (Sl4),
the control means 60 instructs the image pickup control
circuit 40 to execute distance measurement and

When continuous photography is not executed
25 (S18) or the image memory 24 has no area in which
image data can be written (S19), the control means 60
instructs the image pickup control circuit 40 to

10 Control is then returned to the step S16.

When the distance measurement/photometry switch (SW1) is turned on using the operating means 66 (S14), the control means 60 checks the timer for a count (S21), and waits for the distance measurement/photometry switch (SW1) to be turned on by the time instant at which the timer indicates a predetermined count (S14). Although the distance measurement/photometry switch (SW1) is not turned on (S14), when the timer indicates the predetermined count (S22), the display screen for imaging on the display means 64 is aborted (S23) and the run of the imaging program is terminated (S6). When terminating the run of the imaging program, the control means 60 instructs the image pickup control circuit 40 to terminate the operation of the image pickup means 210. The image pickup control means 40 executes the termination processing required for the components of the image pickup means 210 and turns

1 off the power circuit 42.

Yet another embodiment of the present invention will be described below.

5 This embodiment has the same configuration as the one shown in Figs 23A and 23B but operates differently. Fig. 26 is a flowchart of a main routine in this embodiment.

10 When the power supply of the information processing apparatus 300 is turned on or a new battery is loaded in the information processing apparatus 300, the control means 60 resets flags and control variables, and runs a control program stored in an area of the memory means 62; such as, an operating system (S61).

15 When the main switch in the operating means 66 is turned on (S62), the control means 60 determines whether the image pickup apparatus 200 is connected to the information processing apparatus 300 (S63). If the image pickup apparatus 200 is not connected to the information processing apparatus 300, the control means 20 60 runs the control program for the information processing apparatus 300, produces a predetermined necessary display screen using characters, numerals, and pictures including an icon so as to receive information entered at the operating means 66, and 25 executes predetermined processing for the information processing apparatus 300 (S67) according to the information entered at the operating means 66 (S66).

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1 When the predetermined processing terminates, the
control means 60 produces a predetermined necessary
display screen on the display means 64 using
characters, numerals, and pictures including an icon
5 and waits until the main switch in the operating means
66 is pressed (S62).

When the image pickup apparatus 200 is connected to the information processing apparatus 300, the control means 60 reads a program describing how to operate the image pickup apparatus 200 from the program storage means 50, and stores the program in an area of the memory means 62 via the interface 52, connector 54, connector 74, and interface 72 (S64).

The control means 60 reads the program
15 describing how to operate the image pickup apparatus
200 from the memory means 62, and runs it (S65). With
the run of the program, the control means 60 produces a
predetermined display screen necessary for imaging on
the display means 64, sequentially actuates the
20 components of the image pickup apparatus 200 according
to the commands entered at the operating means 66, and
thus achieves imaging.

When all the image pickup operations are completed, the control means 60 terminates the execution of the imaging mode, produces a predetermined necessary display screen on the display means 64 using characters, numerals, and pictures including an icon,

1 and waits until the main switch in the operating means
66 is pressed (S62).

The sequence of the image pickup program to be
run at the step S65 in Fig. 26 is identical to that in
5 any of the aforesaid embodiments, of which description
will be omitted.

Yet another embodiment of the present invention
will be described below.

Fig. 27 is a flowchart of a main routine in
10 this embodiment.

When the power supply of the information
processing apparatus 300 is turned on or a new battery
is loaded in the information processing apparatus 300,
the control means 60 resets flags and control variables,
15 and runs a control program stored in an area of the
memory means; such as, an operating system (S71).

When the imaging-mode switch in the operating
means 66 is on (S72), the control means 60 determines
whether the image pickup apparatus 200 is connected to
20 the information processing apparatus 300 (S73). If
the image pickup apparatus 200 is not connected to the
information processing apparatus 300 (S73), the
control means 60 displays a predetermined warning on
the display means 64 (S77), and waits until the
25 imaging-mode switch is pressed (S72).

If the imaging-mode switch is off, the control
means 60 runs the control program. With the run of

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1 the control program, a predetermined necessary display
screen is produced on the display means using
characters, numerals, and pictures including an icon
so that information entered at the operating means 66
5 is received. The control means 60 then executes the
predetermined processing associated with a command
entered at the operating means 66 for the information
processing apparatus 300 (S76). When the predetermined
processing terminates, the control means 60 produces a
10 predetermined necessary display screen on the display
means 64 using characters, numerals, and pictures
including an icon so as to receive information entered
at the operating means 66, and waits until the imaging-
mode switch is pressed (S72).

15 When the image pickup apparatus 200 is connected
to the information processing apparatus 300 (S73), the
control means 60 reads a program describing how to
operate the image pickup apparatus 200 from the program
storage means 50, and stores the program in an area of
20 the memory means 62 via the interface 52, connector 54,
connector 74, and interface 72.

The control means 60 reads a program describing
how to operate the image pickup apparatus 200 from the
memory means 62 and runs it (S75). With the run of the
25 program, the control means 60 produces a predetermined
display screen necessary for imaging on the display
means 64, sequentially actuates the components of the

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1 image pickup apparatus 200 according to commands
entered at the operating means 66, and achieve imaging.

When all the image pickup operations are completed, the control means 60 terminates the execution of the imaging mode, produces a predetermined necessary display screen on the display means 64 using characters, numerals, and pictures including an icon so as to receive information entered at the operating means 66, and waits until the imaging-mode switch is pressed (S72).

The sequence of the image pickup program to be run at the step S75 in Fig. 27 is identical to that in the first embodiment described in conjunction with Figs. 3A, 3B, 4 and 5, of which description will be omitted.

15 The embodiments have been described so far.
The recording medium 90 may be any of a memory card, a
hard disk, a micro-digital audio tape, and a magneto-
optical disk, an optical disk.

The recording medium 90 may be a composite medium made up of a memory card and a hard disk, which poses no problem. In the composite medium, the memory card may be independent of and freely connectable to the main unit of the composite medium. This causes no problem. On the contrary, the hard disk of the composite medium may be independent of and freely connectable to the main unit of the composite medium, which poses no problem, either. The composite medium

1 may be composed not only of a memory card and a hard
disk but also of two or more of a memory card, a hard
disk, a micro-digital audio tape, a magneto-optical
disk, and an optical disk.

5 The embodiments have been described on the
assumption that the recording medium 90 is independent
of and freely connectable to the main unit of the
information processing apparatus. Alternatively, the
recording medium 90 may be fixed to the main unit of
0 the information processing apparatus.

Two or more recording media 90 may be connected to the information processing apparatus, which poses no problem. One or more recording media 10 may be fixed to the main unit of the information processing apparatus, and one or more recording media 90 may be freely connectable to the main unit thereof. This poses no problem, either.

The communication means 100 is independent of and freely connectable to the main unit of the information processing apparatus. Alternatively, the communication means 100 may be fixed to the main unit of the information processing apparatus.

Two or more communication means 100 may be connected to the information processing apparatus, which poses no problem. One or more communication means 100 may be fixed to the main unit of the information processing apparatus, and one or more

1 communication means 100 may be freely connectable to
the main unit thereof. This poses no problem, either.

The image pickup apparatus 200 comprises the
image pickup means 210 and the program storage means
5 50 for storing programs each describing imaging for
the image pickup means 210. In addition, sound
recording means and program storage means for
storing programs each describing sound recording may
be included. In this case, when a program describing
10 imaging is read from the program storage means 50, a
program describing sound recording is read at the
same time and both the programs are run in the
information processing apparatus 300 to effect imaging
and sound recording.

15 Programs may not be read into the main unit of
the information processing apparatus but may be
allocated to an address space in the main unit.

The information processing apparatus according
to the present invention may include neither display
20 means nor memory means.

As easily understood from the above description,
according to the present invention, an image pickup
apparatus including image pick up means and program
storage means for storing programs to be run by
25 control means is demountable from an information
processing apparatus including operating means and
control means. This results in an image pickup system

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1 offering excellent portability.

Imaging can be achieved in a state in which
an image pickup apparatus having image pickup means
and program storage means for storing programs to be
5 run by control means is mounted on an information
processing apparatus having operating means and the
control means. This results in an imaging system
offering excellent portability.

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